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THE BRITISH JOURNAL

OF

OPHTHALMOLOGY

DECEMBER, 1922

COMMUNICATIONS

OCULAR TUBERCULOSIS*

BY

A. L. WHITEHEAD

LEEDS

IT is with great diffidence that I address you to-night from this distinguished position.

In the first instance I desire to offer you my thanks for the honour you have conferred upon me in electing me your President. I regard it as a compliment to provincial ophthalmology and a tribute to the great school of medicine at Leeds, of which I am a member. Although the honour is great, the responsibility and the obligations involved in the occupancy of this chair are even greater, when I consider the roll of previous distinguished occupants.

It will be my earnest endeavour to maintain the high reputation of the section during my term of office.

In the past year ophthalmology has received important recognition at the hands of the King.

Two members of the Council of this section have been honoured with knighthoods—Sir John Parsons and Sir Richard Cruise. The valuable work which they have carried out is worthy of the highest public acknowledgment.

We have to deplore the loss by death of two distinguished

* Presidential address delivered on October 13, 1922, in the Section of Ophthalmology of the Royal Society of Medicine.

members of the section. Edward Stack, of Bristol, a member of the Council, will be much missed. With an engaging personality he combined a keen and observant mind, a mature judgment and a wide ophthalmic experience.

Charles Wray, of Croydon, an energetic ophthalmologist, has enriched our literature by many contributions.

Epoch-making discoveries are rare in the history of medicine, and rarer in our speciality. I cannot indicate any such discoveries in the past year and I have none to bring before you to-night.

Opportunities for research are few in a very busy clinical and teaching practice, but I may detain you for a few minutes with some observations on a common aspect of eye disease.

The tubercle bacillus is so widely distributed and lesions due to it are so common elsewhere in the body that it is only natural that much should have been written about tuberculous diseases of the eye.

I do not propose to occupy your time with a digest of the extensive literature of the subject, but to give you some of my own impressions of ocular tuberculosis in comparison with the experience of other observers.

Tuberculosis is more frequent in Leeds and less frequent in the West Riding of Yorkshire than in England and Wales as a whole. The official figures supplied to me by the Ministry of Health and the Medical Officer's annual reports are as follows for 1920:—

England and Wales, with a population of 37,524,000, had a tuberculosis case rate of 2.07, incidentally, I may mention, the lowest since 1914.

The West Riding of Yorkshire, with a population of 1,498,453, had a case rate of 1.61, also the lowest since 1914.

Leeds, with a population of 448,913, had a case rate of 2.61, the lowest since 1914.

A large percentage of our cases in hospital and private practice reside outside Leeds, so it is very probable that on the average the general case rate will not be very dissimilar from that of England and Wales as a whole.

Every ophthalmologist must have been struck by the comparative rarity of tuberculous lesions of the eye in pulmonary tuberculosis, and in serious cases of surgical tuberculosis, but if cases of ocular tuberculosis are followed up, there is good evidence that in after years other manifestations are frequently present.

A very valuable paper bearing upon this point was contributed in 1921 by Igersheimer and Prinz[1], dealing with the after history of 92 scrofulous eye cases followed up for 10 to 30 years. They found that in 13.9 per cent. there were changes in the lungs, and in 13 per cent. there were symptoms of active tuberculosis.

In discussing the various forms of ocular tuberculosis, I shall refer again to this question.

There seems to be a very important difference between the severe spreading invasions of the eye, leading to more or less complete destruction of the eyeball, and the more chronic and benign forms of tuberculous infiltration. In the former, typical giant cells are common, and the tubercle bacilli are frequently found; in the latter, careful search and inoculation tests usually fail to demonstrate the bacillus.

There is a general consensus of opinion that in the latter group of cases the infection is due to a tuberculo-toxin acting on a specially prepared area. This view has been supported by experimental evidence by Guillery[2] and others.

Of conglomerate tubercle of the uveal tract, leading to destruction of the eyeball, either by perforation of the outer coats of the eye or by caseation and subsequent shrinking of the globe, I do not propose to say anything.

The standard text-books deal very fully with these cases and my experience coincides with the usual description.

Tuberculous choroiditis.—Miliary tubercles of the choroid in acute tuberculosis of infants are frequently present. In nearly all of the many cases of fatal tuberculous meningitis in which I have had the opportunity of examining the fundus, I have found miliary tubercles.

Isolated tubercles, usually single, are not infrequent, and unless at or near the macula, attract little attention. They occur in the same class of individuals in whom the less severe forms of tuberculous infection of the eye are usually found. They are small, 1/3 to 1/2 of the size of the optic disc, greyish yellow with a soft indefinite margin. In the later stages the circular clean-cut edges of the atrophic patch are very characteristic. Occurring in early infancy, they are not usually recognized until, as the child grows up, the interference with vision attracts attention. I do not think I have seen them in individuals over the age of 30.

Primary tubercle of the retina I have not seen, but I have notes of one case in which I regarded a nodule in the papilla as probably tuberculous. Degenerative changes in the blood vessels, usually the veins, followed by haemorrhages, either small and confined to the retina, or large and bursting into the vitreous, have been described by Jackson and Finnoff and by de Schweinitz.

In my own experience, in two instances, vitreous haemorrhages have preceded any other manifestations of general tuberculous infection. In both these cases, pulmonary tuberculosis became manifest in 12 to 18 months after the appearance of the haemorrhages; in one a typical tuberculous iritis with nodules came

on after the pulmonary signs were defined, but cleared up under treatment.

Chatterton[3], at a meeting of this Section in 1913, reported a case of tuberculous iritis with vitreous haemorrhages treated by tuberculin. It is possible that some of the unexplained cases of recurrent vitreous haemorrhage may be due to toxin infection from a tuberculous focus elsewhere in the body. Several observers, notably Schieck[4], have reported favourably on the use of tuberculin in recurrent retinal haemorrhages.

Tuberculous iritis.—I have nothing to add to the text-book descriptions of the various forms of tuberculous nodules in the iris. We have all seen many examples of the recognized varieties. Again, however, I would point out that in many of the milder cases the nodules are small, disappear early and leave little, if any, permanent change in the iris structure. They occur usually in young and apparently robust adults, frequently females, and with no other evidence of tuberculosis, but often with the family history of susceptibility to infection. In these cases the value of tuberculin treatment by proper dosage has been repeatedly demonstrated.

Hessberg[5] considers that more than 50 per cent. of all cases of iritis are attributable to tuberculosis; he states that the nodules are frequently very small, lasting often only a few hours, and may disappear without leaving any scar. Phthisis and joint tuberculosis are rarely present, but the lymphatic glands of the mediastinum and mesentery are frequently affected. I do not think many ophthalmologists will agree with this extraordinarily high percentage.

Tuberculous disease of the lacrymal sac is not common in my experience. I have seen it secondary to lupus of the nose and as a forward extension of tuberculous disease of the ethmoid.

The possibility of an epiphora and dilatation of the sac secondary to nasal tuberculosis should always be remembered in young adults. In one case under my care, such a chronic dacryocystitis followed a tuberculous ulceration of the inferior turbinate and septum. Tuberculous ulceration of the vulva occurred in this case, a young girl of 12, and was entirely cured by local and general treatment; about a year later a toe had to be amputated for tuberculous "dactylitis"; then the nose and lacrymal sac became affected. Later on the pharynx and larynx were involved. The whole process has continued for 5 years, during which the child has looked the picture of health, and is of the most robust physical development. What her ultimate fate will be I cannot say.

Tuberculous conjunctivitis.—The severe forms with large subepithelial nodules leading to ulceration and formation of large

granulations and the so-called coxcomb excrescences are, in my experience, rare. Lupus of the conjunctiva spreading by direct infection from the face is quite characteristic and calls for no comment.

Many papers have been written in many languages discussing the possible tuberculous origin of the common phlyctenular conjunctivitis of children. Veeder and Hempelmann[6], in the New York *Medical Journal* of 1920, reported 196 cases of phlyctenular disease. There was a positive von Pirquet skin reaction in 93. Tuberculous lesions involving other organs were found in half the cases, and in children kept under observation for one year or longer, four-fifths gave evidence of other tuberculous processes.

For some time past I have frequently noticed a type of phlyctenular conjunctivitis which I have come to regard as definitely tuberculous. It occurs in young adults, rarely in small children, is very chronic in type and resistant to the ordinary treatment. The phlyctenules are small, closely set, aggregated together near the corneo-scleral junction, and there is frequently infiltration of the cornea, with rather large invading vessels; ulceration is very rare. In some instances iritis is also present. I have water-colour drawings of two typical cases of this variety of conjunctivitis with slight corneal invasions and iritis.

In all the cases there are either evidences of tuberculous processes elsewhere or a clear family history of susceptibility to tubercle invasion.

The von Pirquet reaction is frequently positive, but not invariably so, although a definite but slight reaction occurring between 24 and 48 hours after inoculation, and, regarded by some observers as positive, is almost always present.

Examination of the tissue removed does not show typical giant cells or the presence of tubercle bacilli, and inoculation of guinea pigs has given negative results.

Although this group of cases is very resistant to ordinary treatment, immediate and striking improvement follows tuberculin injections. It is most important to give in each case the appropriate dose.

Tuberculin B.E. is used and the initial dose is 1/5,000 mg. to 1/10,000 mg., according to the age of the patient; four-hourly temperature records are taken for 24 hours with the patient in bed; if there is no temperature or general reaction, an increasing dose is given three days later.

Our usual scale is 1/5,000, 1/2,500, 1/1,000, 1/750, 1/500, 1/250, 1/100, 1/50 mg.

When the reaction is obtained the dose is repeated, and if there is again a reaction the dose short of this is given and repeated at weekly or fortnightly intervals according to the case. I have

dealt with this in detail, since I am quite satisfied that only the dose suitable for the individual will give good results. The efficient dose has varied from 1/50 mg. to 1/500 mg. even in cases of about the same age, showing the uselessness of a uniform dose. A severe general reaction is very unusual, an elevation of temperature of 1° to 2° being the usual indication; in a very few cases local reaction at the site of injection with suppuration is the only indication.

Of the method of treatment suggested by Ellis and Gay[7], of tuberculous eyes by the direct local application of various dilutions of tuberculin P.T.O. (bovine) I have no experience, and I do not know whether the authors have found a more prolonged trial of this treatment to justify its use. Appropriate constitutional treatment is of the greatest importance; if possible an entirely open-air life on sanatorium principles should be insisted upon.

Since it is almost established that these minor lesions of ocular tuberculosis are due to toxin infection from a focus elsewhere, it is of the greatest importance to search for such a focus and, when found, to employ suitable treatment. Infected tonsils and adenoids should, of course, be dealt with by operation.

The question of treatment of enlarged glands by operation or otherwise is of great importance.

Wolff[8], of Amsterdam, has strongly urged the value of the treatment of the tuberculous lymphatic glands by X-rays in cases of tuberculous conjunctivitis and keratitis. I have no experience of this, neither have I tried injections of milk in these cases.

Siegrist[9], after an X-ray examination of the thorax in cases of chronic uveitis, came to the conclusion that the intra-thoracic bronchial glands were probably the primary focus.

Directly bearing upon the question of the possibility of the mediastinal glands being the primary focus in cases of toxin infection of the eye, Prof. Stewart has supplied me with some very important observations.

In post-mortems on 100 cases of death from rapidly fatal war injuries on men of the best physique from the front lines, the following striking facts were elicited. In 42 per cent. there were undoubted evidences of tuberculous disease, in 11 per cent. scarring at the apices of the lungs, and in 1 per cent. extensive old pleuritic adhesions, making 54 per cent. probable tuberculous lesions.

In 32 per cent. of the total there were definite signs of glandular infection, 15 per cent. being bronchial, 15 per cent. mesenteric, 1 per cent. pre-panceratic, and 1 per cent. cervical.

In view of these facts indicating the frequency of latent tuberculosis in the glands, it seems very probable that the primary focus in these cases of tuberculo-toxin infection may be in the bronchial or other glands.

Kleinschmidt[10] believes that a small portion of phlyctenular cases only are free from tubercle and many others have a quiescent lesion only.

Ordinary local treatment is also employed, atropin ointment and boric acid lotion irrigations in the early stages, yellow oxide of mercury ointment and powdered calomel insufflations, as the more acute symptoms subside.

Operative treatment in some of the cases is of the greatest value. I have tried excision of the affected conjunctiva in some cases, but without especially satisfactory results. In cases where there is a vascular invasion of the cornea, a form of peritomy is of the greatest service. The most satisfactory results seem to be obtained if a strip of conjunctiva, 2 or 3 mm. in width, is excised all round the corneo-scleral junction and the larger superficial vessels involving the cornea are carefully scarified by the point of a Graefe's knife; six or seven cuts are made across each vessel.

The value of peritomy has been emphasized by several ophthalmic surgeons; my revered colleague, Mr. Pridgin Teale, possibly the doyen of ophthalmologists, now in his 91st year, has advocated the operation repeatedly, and in later years Sir Anderson Critchett and Sir Richard Cruise have urged its performance in suitable cases.

Personally I am firmly convinced that it is one of the most valuable aids to treatment which we possess of these otherwise very intractable cases. In ten recent cases of the type of phlyctenular conjunctivitis which I have described, the ages ranged from 10 to 27, the average being 15.3. In four cases there were enlarged cervical glands; in one a patch or lupus on the cheek, not in the neighbourhood of the eye; in one a tuberculous synovitis of the knee; in one the mother had suffered from tuberculous peritonitis, and in another a sister died of acute pulmonary tuberculosis. Many of the cases had been under the usual treatment for long periods without benefit; in one case for nearly three years, and in another for over 18 months. Peritomy was performed in five cases. In one case where vision had been less than 6/60 six months ago, it is now 6/9 in one eye and partial 6/6 in the other, and the corneal opacities have almost disappeared. In all the improvement was rapid and very marked, and there has been an entire freedom from relapses, which had been frequent before the special treatment was undertaken.

Tuberculous keratitis following infection after injury is, I think, rare, and secondary infection from the conjunctiva, the ciliary body or the iris is equally uncommon. A parenchymatous affection, to some extent simulating the keratitis of congenital syphilis is frequent and is worthy of greater attention. In tuberculous keratitis the surface of the cornea is more irregular, although actual

ulceration is rare, the patches of opacity are less regular in distribution and the vascular invasion of the cornea is much more superficial. The onset is not so rapid and the progress is much more erratic.

In congenital syphilis it is usual to find the keratitis steadily and progressively advancing, followed by steady and progressive resolution. Peritomy is, in my experience, of the greatest value in the treatment of the pannus of tuberculous keratitis and quite valueless in congenital syphilitic keratitis. The possibility of a mixed infection must always be borne in mind.

Tuberculous scleritis and episcleritis, often with involvement of the iris and cornea, are possibly in some instances due to direct tuberculous infection. One of the most serious and intractable cases I have ever seen, occurred in a gentleman whose wife was suffering from advanced pulmonary tuberculosis, although he himself had no evidence of infection elsewhere.

The conclusions to which my observations point, but for which I do not claim any originality, are :—

1. Ocular tuberculosis is much more frequent than is usually taught.

2. Two very well defined classes of these lesions exist.

(*a*) The destructive, caseating or necrosing variety in which the infection is primary, or part of a generalized distribution of tubercle, progressive, and only slightly, or not at all, amenable to treatment. Tubercle bacilli are frequently discovered in these cases.

(*b*) A much milder form of infection, often called attenuated tuberculosis, probably of a toxic nature, since bacilli and giant cells are rarely found. The primary focus is usually not in the eye, and in many cases cannot be discovered by a careful investigation. The bronchial or mediastinal glands may, in many instances, be the focus in question.

In the second class recovery is the rule, with more or less interference with vision according to the areas of the eye affected. In the treatment of this group, properly graduated tuberculin injections are of the greatest value. In tuberculous vascular keratitis, peritomy and scarification of the invading vessels is a most valuable aid to treatment. If the primary focus is in a situation where removal can be carried out by surgical means, operation should be carefully considered. If, as seems frequently the case, the focus is in the bronchial or mesenteric glands, constitutional treatment of the most thorough variety obtainable must be undertaken.

Finally, I wish to express my indebtedness to Prof. Stewart and Dr. McLeod, of the Pathological Department of the University of

Leeds, for valuable assistance in investigating the pathology and bacteriology of some of my cases; and to Mr. S. D. Lodge and the sisters of my wards in the General Infirmary at Leeds, and to various tuberculosis officers for the careful supervision and execution of the treatment.

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OCULAR SARCOMA WITH WIDE EXTENSION, INVOLVING BRAIN AND SPINAL CORD

BY

HUMPHREY NEAME

LONDON

(Conclusion)

Report on the specimen submitted by Mr. H. Neame, F.R.C.S., to the Pathological Committee*

A PATHOLOGICAL Committee was formed at the meeting of the Ophthalmic Section of the Royal Society of Medicine, for the purpose of examining the sections of this specimen and of reporting thereon.

The Committee have examined the specimen submitted to them and are unanimously of opinion that it is impossible to arrive at a definite conclusion as to whether the growth was primarily intra- or extra-ocular.

The majority of the Committee are inclined to the view that the growth was primarily intra-ocular. The sight remaining good for some time after the appearance of an epibulbar growth is not inconsistent with flat sarcoma of the choroid, of which cases have been reported of long duration without serious symptoms.

Flat sarcomata starting in and spreading along the lymph spaces cause almost uniform thickening of the uveal tract, as in this case. They are also specially prone to extend outside the

* See *Proceedings of the Royal Society of Medicine, 1922*, XV (Sect. Ophth.), p. 22.

globe along the perivascular spaces of such perforating vessels as they may encounter.

If in this case the growth had extended from without inwards one would have expected localized enlargements at the sites of the perforating vessels within the globe.

The fact that the whole of the uveal tract is so extensively and evenly infiltrated they consider strong evidence that the growth was primarily intra-ocular.

One member of the Committee (E. T. C.), on the other hand, can find nothing to contra-indicate the view that the growth started in the lymphatic tissue of the conjunctiva at the limbus, and spread from that situation by centrifugal lymphatic permeation, in a similar way to that which epibulbar epithelioma has been found to do. From the conjunctiva it may have permeated along the veins leading to the canal of Schlemm, and from it to the lymphatic spaces of the uveal tract, giving rise to a flat intra-ocular growth. Extraocularly it may have extended similarly into Tenon's capsule, and from it along the lymphatic channels of the perforating blood vessels into the sclera.

Such a view seems to him more consistent with the clinical recorded observations, the growth having first attracted attention in the epibulbar region, and the failure of vision and other intra-ocular symptoms not having been observed until considerably later.

(Signed)

E. TREACHER COLLINS,
W. T. LISTER,
M. S. MAYOU,
J. HERBERT PARSONS.

Further notes on case of Ocular Sarcoma

F. B. This man was examined again on June 10, 1922. He had the experience of being decidedly weaker than previously. He complained of numbness of the feet and the back of each leg, also of the buttocks and anus. He stated that during defaecation he was not certain as to whether faeces or flatus were passed. He had a similar deficiency of sensation on micturition. The knee jerks were absent; his gait was unsteady, wide-based and with the help of a stick. The left orbit was in the same condition as before, except that there was slightly more discharge on pressure around the scar, which was still unhealed in the centre. The patient was transferred to the London Hospital, under the medical unit, in the immediate charge of Dr. G. Riddoch.

(Admitted to the London Hospital on June 23, 1922.)

On admission, the central nervous system showed the following signs:—

Loss of sense of smell.

Reflexes: Knee jerks not obtained.

Sphincters: Does not wet himself nor soil clothes. Delay in micturition.

Sensation: Definite loss of postural sensibility in toes of both feet.

Muscles: General wasting of both lower limbs, but no local atrophy of muscles.

Loss of power in both lower limbs.

Slight inco-ordination in both lower limbs.

C. S. fluid, examined in the Clinical Laboratory, was of pale yellow colour and contained an excess of protein, and showed a great excess of cells. The nuclei of these cells were much indented and multi-lobulated, and many of them showed irregular mitosis. In the opinion of Dr. P. N. Panton the only possible diagnosis was that of sarcoma[31].

Blood:	Polynuclear neutrophiles ...	72.5 per cent.
	Small lymphocytes	13.5 ,, ,,
	Large ,, ...	1.5 ,, ,,
	Large hyaline cells	12.5 ,, ,,
		100.0

There was a perforation of the hard palate, about 0.5 cm. in diameter, with smooth healed edges. An obturator was present to close this.

On July 24, 1922, there were cramps of both legs. The arms showed slight ataxia. Wasting of both forearms and hands and slight weakness of arms were noted.

On August 26, 1922, the patient had two fits lasting 10 minutes and 5 minutes. He remained unconscious and died on the same day, 3 years and 3 months after the onset of the first symptoms.

At the post-mortem examination was found a grey gelatinous infiltration of the optic nerves, to a slight extent of the basal cisterns and convolutions, and of the third cranial nerves, right and left. There was a similar infiltration beneath the arachnoid membrane over the whole of the spinal cord, which was most marked in the lower lumbar region and cauda equina. There was also a mass of firm gelatinous growth filling the left orbit. There was a perforation of the hard palate, replacement of the body of the ethmoid by grey gelatinous and opaque yellow tissue. There was foul purulent rhinitis, and a rounded mass, about 1 cm. in diameter, in the right testicle. Liver, spleen and kidneys showed no macroscopic involvement.

Pathological examination of a lumbar nerve root

Specimen fixed in Bouin's fluid. Paraffin embedding. Ehrlich's haematoxylin and eosin, v. Gieson and Weigert's iron haematoxylin staining.

Transverse section of nerve root.

There is some spacing of the connective tissue around and between the nerve bundles and also of nerve fibres in the bundles. There is a diffuse infiltration, not very dense, of cells in the connective tissue of the septa. Also to a slight degree within the nerve bundles. Many of the cells are free. They are of various shapes and sizes, with fairly abundant cytoplasm, which takes a well-marked eosin stain (much as the connective tissue fibres).

The nuclei are of varied form and size. They show for the most part a very deeply-stained boundary, deeply-stained nuclear granules, and coarse chromatin threads with irregular spaces between them. Some have a crenated margin and bear a resemblance to those described by Dr. Panton,[31] which were obtained by lumbar puncture in this case. A few cells show karyomitosis. In this connection the rarity of invasion of nerves by cells of sarcoma or carcinoma may be emphasized, as pointed out by Shattock.[32]

The histological investigation of other tissues and organs from the post-mortem examination reveal the following :—

Left orbit. A mass of new growth implicating the optic nerve and surrounding and invading the latter. The cells of the growth lie in the fibrous septa of the nerve and some also within nerve bundles.

Basal cisterns, right temporal and right parietal cerebral cortex, floor of fourth ventricle, cervical cord, thoracic cord, and cauda equina all show infiltration with cells of new growth, particularly marked around the blood vessels.

The sections of the right testicle show a rounded mass of new growth with some haemorrhages in it.

The prostate shows infiltration with similar cells, and abundant haemorrhages.

Part of the ethmoid—decalcified—contains a layer of new growth which extends to the mucosa.

In all these situations the cells are, in the main, of rounded form, with irregularities owing to contact with neighbouring cells. There is fairly abundant cytoplasm to about one third of the diameter of a cell. The nucleus is round, oval or kidney shaped, considerably larger than that of a lymphocyte, and containing two or three darkly-stained nucleoli and coarse chromatin threads.

In the description of the microscopic appearance of the original ocular growth it will be remembered that attention was drawn to

certain points of resemblance between the minute structure of this growth and that of " glioma " retinae—called by some general pathologists " round-celled sarcoma of retina." In the extension of this growth along the nerve structures and its wide spread in the meninges there is a still more remarkable resemblance.

Conclusion

The consideration of this case would not be complete without a revision of the evidence as to the origin of the neoplasm, in the light of the post-mortem findings.

The structures and regions involved were: Eyeball, orbit, ethmoid, brain and spinal cord, testicle, prostate.

The fact that symptoms were not referred to the testicle or to the prostatic region, and that the mass in the testicle was small, and that there was no obvious enlargement of lumbar lymphatic glands at the autopsy is sufficient to allow of exclusion of each of these organs as primary focus.

The probability of origin of the growth in the ethmoid and extension therefrom to the orbit and eyeball is not great. The issue is confused to some extent by the concurrence of tertiary syphilis of palate and nasal cavities.

Arguments against the adoption of a theory of nasal origin are:—

1. The subsidence of nasal symptoms with specific treatment.

2. The long history of presence of swelling on the eyeball—3 years and 3 months from the time of its discovery until date of death—without any obvious exacerbation of nasal symptoms during that time.

3. The central position of the orbital recurrence.

It would seem, therefore, that an ocular origin is fairly established.

Whether the round-celled sarcoma originated in epibulbar tissue or in the uveal tract it was remarkable for its wide extension in the planes of the tissues of the eyeball, for its spread along the meninges of the brain and spinal cord, and for the absence of visceral metastases apart from those in one testicle and the prostate.

The writer expresses his indebtedness to Sir John Herbert Parsons for facilities received for the examination of the patient and for permission to report the case; also to Professor H. M. Turnbull for the free use of the pathological material of the autopsy; and to Dr. P. N. Panton and Dr. G. Riddoch for their assistance.

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TEST TYPES*

BY

H. HARTRIDGE AND H. B. OWEN

INTRODUCTION

AT the present time Snellen's test type is the one most often used in ophthalmic practice. Recently, however, it has been proposed to substitute the alternate type devised by Green. It appeared to us desirable, before any definite recommendations had been carried out in practice, to examine the basic principles on which test types depend, in order that the greatest efficiency might be obtained in any type that was substituted for Snellen's.

SECTION I

The resolving power of the eye

It is well known that there are two factors which set a minimum limit to the distances between two bright objects in order that they may be seen as two by the eye. The one factor concerns the structure of the retina, the other the optical properties of the lens system of the eye.

In order that the two bright objects may be seen as two by the eye, it is necessary that their geometrical images formed on the retina should be separated by at least one cone. Further, the two geometrical images must be such a distance apart that when blurring occurs, owing to diffraction and aberrations, the overlapping should not be so great that the intensity of illumination of the area between these images is not appreciably less than that corresponding to the centres of the geometrical images themselves.

The histological limit set by the diameter of the foveal cones is found to be approximately 46 seconds of arc, the optical limit with a pupil of 3 mm. diameter and white light having an approximately identical value. Experimentally, the limit is found to be 58 seconds of arc. For example, in the case of a grating consisting of alternate white and black bars, the centres of the black bars must subtend an angle of nearly 1 minute of arc in order that resolution should take place.

In both Snellen's and Green's test types normal visual acuity is said to be obtained when letters are visible, the separate black components of which subtend an angle at the eye of 1 minute of arc, and the distances between the centres of the separate black bars subtend 2 minutes of arc. This, as Parsons points out, is approximately one half the highest visual acuity shown by experiment for a grating test object.

If a test object be employed different from the grating type, e.g.,

* This research was carried out at the request of the Secretary to the Committee appointed by the Council of British Ophthalmologists to consider test types.

a single black line on a wide white field, altogether different values are obtained. The values ascertained by experiment by a number of different observers are given in the table below.

TABLE I

Acuity of Vision for black bar on bright ground.

Aubert	6′	
Smith Kastner	3·5′	Spider's web
Hartridge	3·6″	Bright brass wire*
Hartridge and Owen	3·1″	Black brass wire*
Mean ...	4·0″	

It will be seen that the value obtained by ourselves is approximately 3.1 seconds of arc, that is, that the width of the black line must subtend this angle at the eye in order that it should be visible. This will be found to be about 1/9 the width subtended by the black bars in a grating in which the alternate black and white bars are presumed to be of equal width, and this value is, moreover, approximately 1/18 the width of the separate black components of the lines in Green's and Snellen's types. Taking for example the letters L and J which approximate to single black lines on a white ground, it would be expected that such letters would be appreciated at very much greater distances than would letters such as S, R, O, or B, which approximate much more closely to the grating in form, in that overlapping of the aberration images of the different components takes place to a considerable extent.

SECTION II

Experimental results with test type

So important did these theoretical considerations appear to us, that we put the matter to test in the following manner.

A series of letters was prepared, conforming to Green's type. The letters were 5 mm. high, 4 mm. wide, and each black component had a width of 1 mm. From this series certain letters were excluded, e.g., W, Q, M, and G. The remaining letters were fixed to slips of wood so that they could be presented in turn to the observer by the examiner. The latter presented the letters in an irregular order and recorded the answer given by the observer. For example, if V was presented and Y given as the answer, Y was recorded in the column under V. In this way not only was it possible to ascertain the number of mistakes that had been made in the case of any one letter, but also what that letter had been mistaken for. We carried out the tests at a number of different distances, and the results obtained are given in the following table :—

* Both mounted such a distance in front of white paper that no shadow was cast.

GREEN'S TYPE.

Distance.	5 Metres.		7·5 Metres.		8.5 Metres.		10 Metres.		12 Metres.		Mistakes.	Chosen Letters.
Observer.	H.	O.	H.	O.	H.	O.	H.	O.	H.	O.		
	Dull Daylight.		Bright Daylight.		Bright Daylight.		Bright daylight.		Bright daylight.			
No. of Tests.	10	10	5	5	5	5	5	5	5	5	60	
Letter.											Total.	
S	**	**	XXBB	BBXXR	RBKL	XXYE	KKLA	AKKXB	VVVZX	KKLYN	36	
R	**	**	KKA	KK	KKS	KKKK	KKXXW	BKKKK	KKZZ*	XXXNK	32	
O	DCCD	*C	D	*	EEDX	C	JAZE	AACAD	PPPFU	EEELC	30	
B	*DD	**	SSB	DDD	AXRS	PDE	KKKRA	*	XXKK	XXENS	29	
C	**	**	*	*	EEEE	*	EEAAL	EEE	LLOUJ	AALED	22	
K	*R	*R	RRSA	R	XXR	*	J	HBR	NXZ	LZANR	22	
V	XY	*Y	*	*	TT	YYY	TTTYY	SV	TTYB	YNK	22	
Y	VT	—	VV	V	TTV	TT	VVVT	—	VVEAX	TTKN	21	
D	C*	**	*	*	N	*	AAAAA	CE	AAAA	EP	15	D
T	**	**	*	*	V	*	VYY	Y	VVVYE	YYYNV	15	T
U	**	**	*	*	*	*	ZVXJ	PV	EJFCP	AAVC	15	U
Z	**	**	*	*	XT	*	XVA	*	YYXBB	XXXY	15	Z
F	**	**	*	*	*	*	ZJ	JP	JJJJJ	JJJJJ	14	F
P	**	**	*	F	F	*	FF	F	FFFFF	JJFY	14	P
X	**	**	*	*	TA	*	YYTV	*	YYTV	TTYY	14	X
H	NN*	**	*	*	*	*	NNN	*	FFFC	PPPX	13	H
N	**	**	*	*	*	*	XXXZV	*	KKZ	RRPJB	13	N
E	**	**	*	*	NX	*	X	A	AF	TTX	9	
J	**	**	*	*	*	*	X	*	FLTC	CCF	8	
A	**	**	*	*	*	*	XL	*	*	TTP	5	
L	**	**	*	*	*	*	V	*	U	T	3	
G	—	—	—	—	—	—	—	—	—	—	—	
I	—	—	—	—	—	—	—	—	—	—	—	
M	—	—	—	—	—	—	—	—	—	—	—	
Q	—	—	—	—	—	—	—	—	—	—	—	
W	—	—	—	—	—	—	—	—	—	—	—	
Mistakes	17		30		53		101		166			
Vision	6/4.2		6/2.75		6/2.45		6/2.05		6/1.7			

The type was 4mm. × 5 mm. (black = 1 mm). This equals Snellen's standard (6/6) at 3.44 metres.

H's total mistakes, 217. O's total mistakes, 150.

The preceding table shows in the first place that, as would be expected, the number of mistakes increased as the distance between observer and test letter increased. Thus at 7.5 metres the total number of mistakes was 30, at 8.5 metres it was 53, at 10 metres 107, and at 12 metres 165.

Further, the total column giving the number of mistakes made in 60 presentations of each letter, shows that whereas letters like L and J have a very high accuracy, other letters such as R, O, B, and S have a very low accuracy. The experimental results fit in almost exactly with the theoretical conclusions drawn in the previous section, namely, that letters which consist of one or two components only are much more readily recognized than are letters in which there is considerable overlapping of the aberration discs formed by the different component parts. In fact, it may be stated that the only letter with which unexpected results were obtained was E. Few mistakes were made, whereas many were expected. It is possible that the frequent use of this letter causes it to present itself more readily to the mind. But the experimental tests show that midway between these two extremes there are a number of letters which have very nearly the same experimental error. For example, the following nine letters were recognised correctly almost the same number of times:—D, F, H, N, P, T, U, X, Z.

Now Snellen's type, *e.g.*, as produced by Curry and Paxton, contains letters differing greatly in difficulty as the following table shows:—

TABLE III

Letter.	Number of Appearances.	Relative Acuity*
E	14 per cent.	0·85
T	13 per cent.	0·74
L	11 per cent.	0·71
Z	8 per cent.	0·84
D	6 per cent.	0·82
A	5 per cent.	—
B	5 per cent.	1·00
F	5 per cent.	0·81
O	5 per cent.	0·80
V	5 per cent.	0·78
G	3 per cent.	0·92
N	3 per cent.	0·85
P	3 per cent.	0·81
R	3 per cent.	0·88
C	2 per cent.	0·79
M	2 per cent.	—
H	1 per cent.	0·92
K	1 per cent.	—
Y	1 per cent.	0·81
I	0	—
J	0	—
Q	0	—
S	0	0·89
U	0	0·79
W	0	—
X	0	—

* Values given by Sheard in *American Jl. Physiol. Optics*, 1921, II., p. 168.

It will be noted that difficult and easy letters both appear, and that the number of appearances bears no relationship to the difficulty of recognition.

SECTION III

Practical conclusions

If the proposal to select Green's test types in preference to Snellen's be adopted, and with this proposal we agree, the practical conclusion that we can draw from the results of the above experiments is that the nine letters which we have selected should alone be used; because otherwise letters of very different difficulty will be employed, which will inevitably lead to ambiguous results.

We are also of the opinion that test type for near vision should be similar to that used for testing at a distance, the size of the type being proportionately reduced.

Reference to the following table will show the number of mistakes made by us at different distances using the nine letters of Green's test type that we have selected:—

Distance in metres	Snellen's fraction	Relative acuity	No. of mistakes in 90 tests
3.44	6/6	1.0	0
5	6/4.2	1.45	0
7.5	6/2.75	2.18	1
8.5	6/2.45	2.47	7
10	6/2.08	2.91	38
12	6/1.7	3.5	78

It will be seen that errors increased rapidly when the distance exceeded 7.5 metres, that is when Snellen's fraction was less than roughly 6/3. Since neither experimenter was selected on account of exceptional visual acuity, it seems to us that 6/6, or even 6/5 is far too easy a test for normal visual acuity. We, therefore, recommend that lines of 6/4 and 6/3 be added to the test card for use if required.

We should perhaps point out that we are well aware that the recognition of a letter involves mental processes with a strong personal factor. It is quite possible that if as the result of experiment another pair of observers drew up a selection of letters of medium difficulty their list and ours would not agree. In fact, we would go so far as to say that it is probable that even a selection made by 100 individuals would not exactly tally with that made by a different set of 100 individuals. It appears to us that this is a difficulty which is inseparably connected with the use of any kind of figure, letter, or pattern for the purposes of test type. Yet the advantages of letters are manifest, and the additional advantage of

using a few letters instead of a complete alphabet is also clearly marked.

Since the above was written we have found a paper by Dr. P. J. Hay (*Trans. Ophthal. Soc.*, XXXIX, 1919) bearing on this question. Hay states that he has selected the easiest letters. Unfortunately the experimental evidence on which his selection is made is not given. His selected list contains the following letters:— A, C, E, H, L, N, O, T. The letters X and Z, he says, are left out because they are not so "familiar" as the others. If Hay's list and our own be compared it will be observed that the only letters common to them both are H, N, and T. The fact that so few letters appear in common is readily explained as follows:—

1. Hay chose the easiest letters, whereas we selected those of medium difficulty.

2. Hay's selection was for a type of his own; our selection, on the other hand, was for standard Green's type. If X and Z be excluded as Hay would suggest, we think that two letters valuable for testing cases of astigmatism will be omitted.

Summary

1. Experimental results with grating test objects show that the optical limit imposed by the lens system of the eye, and the histological limit imposed by the finite diameter of the cones hold good for the fovea; the limiting value being 58 seconds of arc.

2. Experimental results with single isolated contours show, on the other hand, that the fovea has a much higher acuity for this type of object, the limiting value being approximately 4.0 seconds of arc.

3. Certain letters of the alphabet can be selected as approximating to the grating type of test object, in that considerable overlapping of the aberration images of the different components occurs: for example, in the case of Green's type the letters S, R, O, and B. Other letters, on the other hand, can be selected as approximating to the isolated contour type of test object: for example, in the case of Green's type L and J. The expectation that the latter would be recognized at much greater distances than the former was justified by experiment. Thus one mistake was made out of 10 tests at 10 metres in the case of L and J, whereas, at the same distance 10 mistakes out of 10 tests were made in the case of R, 9 mistakes in the cases of S and O, and 5 in the case of B. In order to reduce the number of mistakes to one, a distance not greater than 5 metres would have to be used in the cases of S, R, O, and B.

4. Experiment showed between these two groups, L and J, on the one hand, and S, R, O, and B on the other, a group of

letters of medium difficulty, the number of mistakes made in their recognition being approximately equal. The letters in the case of Green's type were D, F, H, N, P, T, U, X, and Z. We recommend that these letters be alone used on the test card.

5. These letters of medium difficulty were recognized, without any mistakes, when they were placed at such a distance that they corresponded to Snellen's fraction of 6/3. We, therefore, recommend further that lines of type corresponding to 6/4 and 6/3 be incorporated on the test card.

PRELIMINARY COMMUNICATION ON INJURY AS A CAUSE OF DIABETES INSIPIDUS WITH BITEMPORAL HEMIANOPIA

BY

PROFESSOR C. PASCHEFF

SOFIA

DURING the late war four cases of wounds involving the chiasma have come under my observation, one of which is worth recording

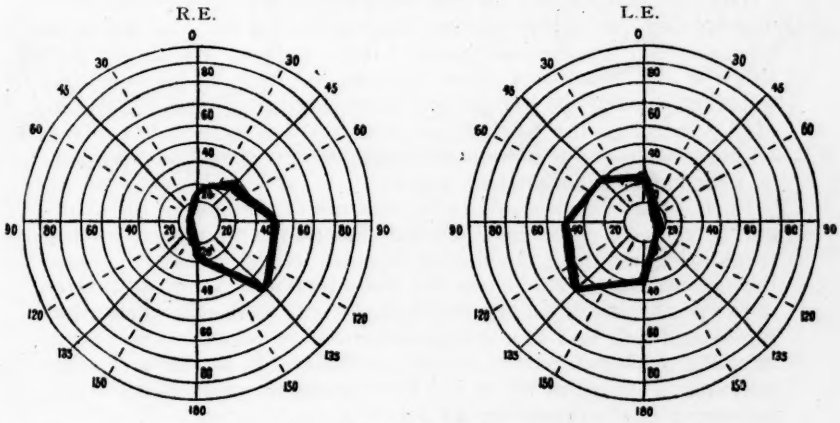

FIG. 1. CASE I.

on account of the accompanying symptoms, especially the occurrence of diabetes insipidus.

This case was that of an officer wounded on March 22, 1917, by a bomb explosion. He was unconscious for 20 days following the injury, which was over the right eyebrow. At the end of a month the following symptoms were observed: bitemporal hemianopia (Fig. 1), diplopia, polydipsia, polyuria (from 4.5 to

9 litres in 24 hours), falling of hair, loss of sexual appetite, anhydrosis, staggering gait, marked asthenia, anosmia, deafness of the left ear and loss of sensation with absence of reflex of right cornea. R.E. V. 6/24; L.E. V. 6/9.

Urinary analysis was as follows:—Specific gravity, 1,004; no sugar or albumin.

Blood examination showed:—

Lymphocytes	31.8 per cent.
Large mononuclear lymphocytes...	2.3 ,, ,,
Transition forms	4.5 ,, ,,
Polynuclear neutrophiles	60.4 ,, ,,
Eosinophiles	1.0 ,, ,,

The patient has remained under my care for the last 3 years and has been treated by electricity and injections of pituitary gland. He has improved considerably and can walk well and feels much stronger. The bitemporal hemianopia and the polyuria have remained unchanged, and there has been no improvement in the left labyrinthine deafness and the general sensation of cold, especially in the feet. Radiographic examination only shows a relative enlargement of the sphenoidal sinus.

The chief importance of this observation lies, in my opinion, in the coincidence of the bitemporal hemianopia with the diabetes insipidus and the common cause of both of them. Doubtless the shock of the injury was conveyed from the right eyebrow to the sella Turcica and the left petrosal bone, and so produced a lesion of the chiasma, the hypophysis, and the left labyrinth. The affection of the right oculo-motor and optic nerves may be regarded as a secondary inflammatory lesion.

Such a lesion caused a bursting fracture of the base of the skull and must have acted in a crossed direction with regard to the fronto-occipital line; the line of fracture would necessarily pass through the sphenoidal sinus and the sella Turcica, and so injure the hypophysis. That the hypophysis was affected is shown by the loss of hair and sexual appetite, muscular weakness specially affecting the legs (he was unable to walk), and in particular by the polyuria, a symptom which has been produced experimentally by lesions of the pars intermedia.

As regards the connection of diabetes insipidus with lesions of the hypophysis, the question arises why this symptom is not always present in disease of that structure. In the absence of post-mortem evidence it is difficult to say, but speaking from a clinical point of view, I consider that much depends on the nature and situation of the disease. I have observed two other cases of bitemporal hemianopia, in one of which diabetes insipidus was present, but not in the other. In both cases there was a tumour

of the hypophysis. The case in which diabetes insipidus was present had a sudden onset with intense headache. Forty days later vomiting set in, with failure of vision. Thirst was complained of and water was passed three or four times a night. Pains on the top of the head and about the waist were also present, and there was occasional diplopia. Sweating ceased, and all sexual desire was lost. The patient slept much and complained of feeling very weak and cold. The visual field showed bitemporal hemianopia with a relative central scotoma for colours (Fig.2). Right and left vision was 6/60, and left pupil was larger than right.

Urinary examination showed a specific gravity of 1,005, no sugar or albumen; 6 litres in 24 hours. A radiograph showed no abnormality in the neighbourhood of the sella Turcica.

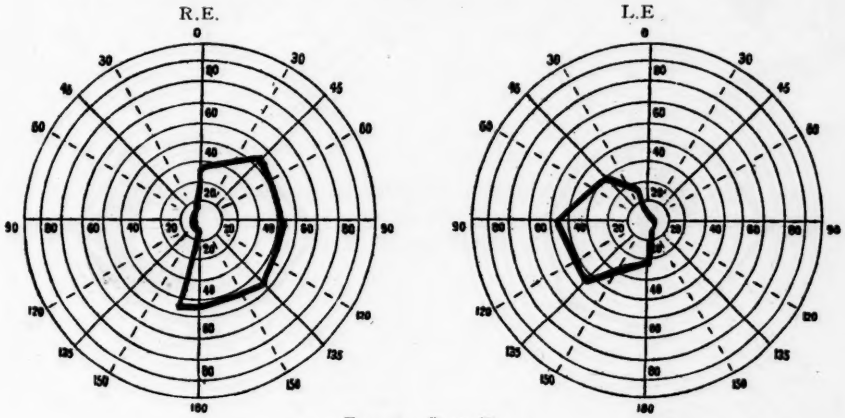

FIG. 2. CASE II.

In this case the symptoms are exactly the same as in the traumatic case first described, bitemporal hemianopia, diabetes insipidus, anhydrosis, the sensation of cold and the absence of sexual desire. In addition, there is the headache due to compression from the tumour.

The third patient was a doctor of philosophy who noticed a dark spot before the left eye accompanied by headache on July 11, 1913. Four days later he suffered from noises in the ears, loss of equilibrium and vertigo. Marked sweating, together with bleeding from the nose were also present. A week later he had improved, and 2 months after the onset of the disease consulted me on account of the failure of vision. His vision was then 6/60 in each eye.

The visual field showed bitemporal hemianopia with bitemporal

hemiachromatopsia (Fig. 3). Pupillary reaction was good, but the left pupil was larger than the right.

There was no polyuria, and the urine was normal, with a specific gravity of 1,014. Pulse was slow (60).

As there was a history of a chancre, although the Wassermann reaction was negative, treatment with salvarsan, mercury and strychnine was tried. His vision improved to 6/24 in the right eye and 6/18 in the left, but the headache remained. Sight again failed in 1914, and on April 23 of that year he was operated on by Professor Neumann in Vienna for tumour of the hypophysis. After the operation his sight immediately improved and remained good until the end of 1919, when the left eye again failed. The pupillary reaction to light was then lost, though that to accommo-

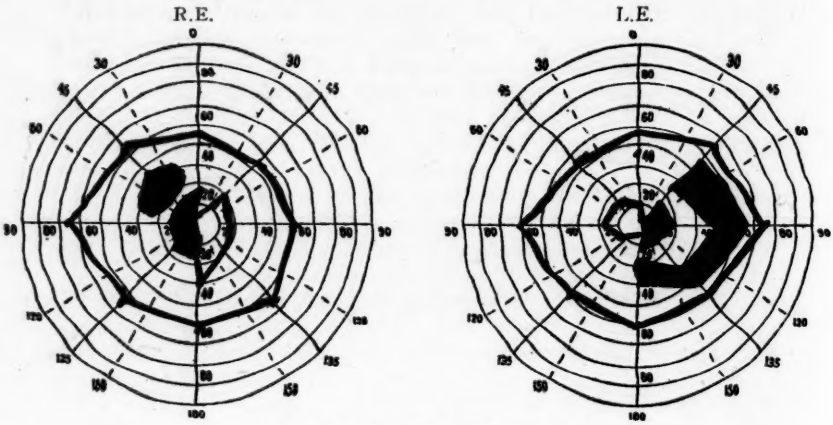

FIG. 3. CASE III.

dation and convergence remained. The right pupil was greater than the left. The temporal half of the left disc was pale. R.E. V. 6/9, L.E. V. counts fingers at 20 cm. He was unable to read on account of the scotomata (Fig. 4). His temporal visual field was less clear than the nasal one. Objects in the temporal half were seen as through a fog. A fortnight later the fields were as shown in Fig. 5.

In this case there was no diabetes insipidus in spite of the existence of a hypophyseal tumour. The case is also interesting on account of the absence of a definitely limited hemianopia and the return of almost normal vision after operation. Although the vision recovered at once the headache persisted for a fortnight. The operation was followed by right hemiplegia and aphasia which lasted a year to a year and a half, and he has still some difficulty

in articulation. The immediate improvement in vision was followed by a relapse in which the fog on the temporal side

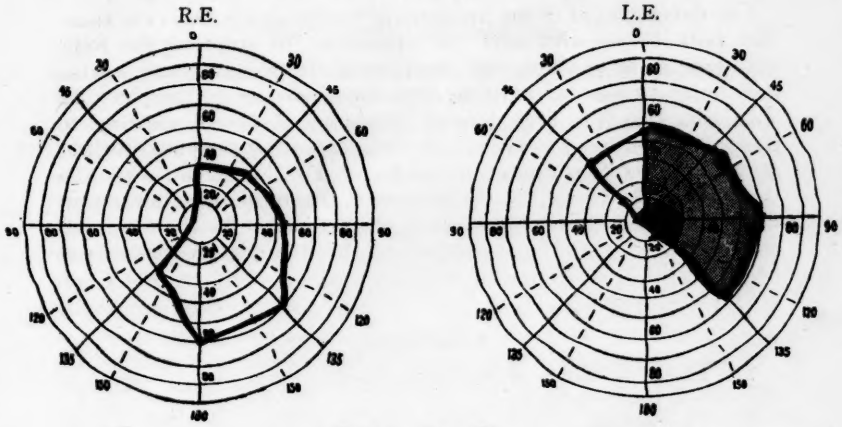

FIG. 4. CASE III.

reappeared and he was unable to read as the letters danced before him. This dancing of objects and constant movement I have also seen in a case of cerebral hernia in the occipital region.

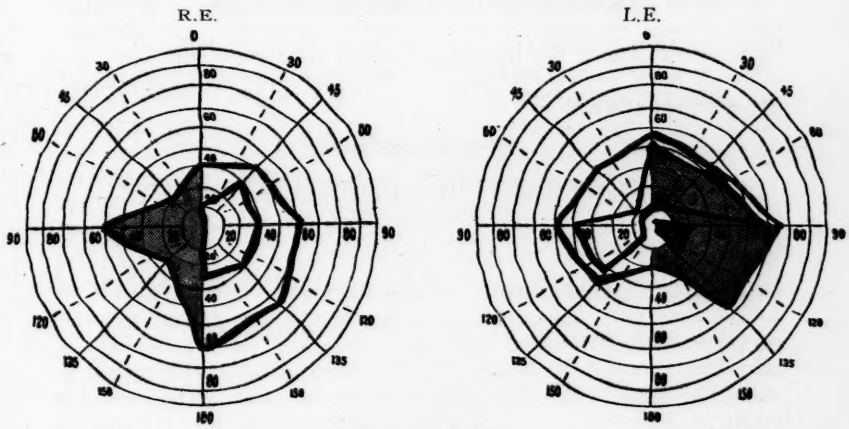

FIG. 5. CASE III.

In October, 1919, he again noticed a dark patch before the left eye which projected in the form of a cone over the nose to his right side. After a rest the patch lost its dark colour and became greyish and vision improved.

A radiograph then showed extensive change in the neighbourhood of the sella Turcica. One anterior and both posterior clinoid processes were destroyed.

The development of the hemianopic symptoms in this case show that both before and after the operation, in spite of the long duration of the disease, the affection of the chiasma was not so definite and advanced as in the first two cases.

In this case the first definite symptom observed pointing to hypophyseal disease was, as in the first case, the loss of equilibrium accompanied by weakness of the feet. The headache, which in these cases is always felt on the top of the head, was due, as in the second case, to the pressure of the tumour. As there was no other definite symptom of disease of the hypophysis, had it not been for the operation, the diagnosis might well have been one of cerebral syphilis.

Conclusions

1. The importance of bitemporal hemianopia as a symptom of disease of the hypophysis.
2. The nature of the headache which radiates from the central parietal region to the top of the head.
3. The unsteady gait accompanied by weakness of the feet.
4. In cases in which diabetes insipidus is present the constant sensation of cold, especially in the feet.

Other symptoms, anhydrosis, loss of hair, absence of sexual appetite and acromegaly are not always present. The physiological function of the hypophysis must be a very complex one, either in itself or in its relations to the other endocrine glands and the nervous system.

COUNCIL OF BRITISH OPHTHALMOLOGISTS—REPORT ON SIGHT-TESTING BY OPTICIANS

IN 1906, and again in 1919, opticians have made application to the Legislature that their craft may be legally recognized for the purpose of sight-testing, and it is consequent upon these efforts that the Council of British Ophthalmologists has thought it desirable to consider the matter in the interests of the general public.

Training of opticians

The Council would warmly welcome any scheme which would lead to greater efficiency in the making and fitting of spectacles. It fully recognizes that there is a very definite need for a greater

supply of properly trained opticians, and ophthalmic surgeons often have cause to deplore the inefficiency displayed in carrying out their prescriptions for glasses.

Sight-testing by opticians

In a recent petition (1919), the British Optical Association claimed that opticians should be recognized as capable, not only of carrying out the optician's art of making and fitting glasses in conformity with prescriptions, but also of measuring and determining what glasses are required to compensate for defects of vision in any member of the public who may apply to them. Paragraph 10 of the petition stated :—" In a very large majority of refraction cases which can be treated by glasses, members of the public do, in fact, visit an optician rather than an ophthalmic surgeon or medical man, and the association humbly submit that it is eminently in the public interest that the optician should be a skilled man and under suitable supervision. A qualified optician, especially when holding a Fellowship Certificate of the Association, would recognize a case in which the eye, through disease or otherwise, could not be properly treated by glasses, and would direct the patient to an ophthalmic surgeon or medical man. An ignorant optician would be likely to supply the patient with glasses which might do great harm."

Training necessary for sight-testing

The Council, however, considers that no course of training short of that required for full medical qualification can produce the skill and judgment necessary to secure the requirements stated in the above paragraph. Every medical man dealing with ophthalmic cases must be equipped with the knowledge necessary for ordinary qualification in medicine and, in addition, with special knowledge of the most delicate and complex sense organ in the body. *It is the opinion of the Council that any State recognition of sight-testing by persons possessing only an optical qualification would not be in the interests of the community.*

The scientific principles of sight-testing

The art of prescribing glasses can be divided into two periods—the purely empirical period preceding 1850, when only subjective methods of testing were available, and the period following 1850, when accurate objective measurements began to be used. (*See* Appendix.) Those scientific methods have been developed by medical research, and to a great extent they are not available to the optician. The statement that where defective vision is due to other than optical conditions it should be treated by a duly

qualified medical practitioner (see petition of the British Optical Association, par. 10, quoted above) is in itself sufficient argument against the optician's claim, since it is well known that changes in the refraction of the eye are often produced in the early stages of serious eye disease. In many such cases an optician may be successful in raising the acuteness of vision to a normal standard, but he would almost inevitably fail to recognize the disease which is the cause of the refractive error. In fact, disease very serious to the eye, or threatening even life, may occur in an eye with perfect acuity of central vision.

Use of drugs

An adequate examination of the eyes and a correct determination of the error of refraction cannot be made in young children, especially in cases of squint, while the accommodation (i.e., focussing power) is active. The absence of accommodative effort can only be ensured by the use of certain drugs, which also dilate the pupil. These drugs must not be used in an indiscriminate manner. In certain conditions of the eye their employment is attended by grave risk to sight. In some individuals they produce serious constitutional disturbances. As dilators of the pupil their use is frequently essential in order to determine the presence or absence of changes in the retina or optic nerve. Such changes may be the first indication of general disease, by the prompt treatment of which the life of the patient may be saved or prolonged.

Eye defects and general disease

The treatment of headaches, associated with errors of refraction, demands not only the use of glasses, but also constitutional treatment, which can only be determined by a medical man. In some cases of defects of the muscular balance of the eyes, the use of prisms is necessary. The correct estimation of these and a complete investigation of the case are most difficult problems, since some of these muscular defects are among the earliest signs of serious diseases of the nervous system.

Changes in the refraction of the eyes are often produced in the early stages of eye disease. For example, myopia (" shortsight ") often appears in the early stages of cataract, or of chronic glaucoma, a disease which untreated inevitably leads to blindness. Hypermetropia (" longsight ") may be met with in the early stages of a malignant tumour. In such cases glasses may bring visual acuity up to a normal standard, but an optician will fail to recognize the disease which will thus be left to run its course.

Optical defects and disease constantly overlap; the former cannot be differentiated with certainty from the latter, nor the latter

definitely excluded by any but a medical practitioner who has had special training and experience.

Optician's standpoint

The " sight-testing optician " endeavours either to supply spectacles with which the customer considers he can see to his liking, or to provide such lenses as will convert optically imperfect eyes into accurately focussing instruments. All are agreed that the former procedure is indefensible: the latter needs further consideration.

The eye is an integral part of the human body. Developmentally it is, in its most essential elements, an off-shoot of the brain. There is practically no organ of the body which does not react upon it to its advantage or its detriment. Without exposing it to the gravest misfortune it cannot be dealt with as an inert, isolated optical instrument, yet it is in this way only that the optician can view it, and in this way only can he adapt mechanical apparatus to such of its optical defects as his limited means may enable him to recognize. Without the use of drugs to dilate the pupil or paralyse the focussing muscle, in many cases he cannot measure accurately the error of refraction, or be in a position to identify the cases which demand medical advice and treatment. If he were allowed to use such drugs he would become an even greater danger to the community by reason of serious disease which he in his ignorance might produce.

Ophthalmic Surgeon's standpoint

The ophthalmic surgeon approaches his refraction work from an entirely different standpoint. To him the eye is an optical instrument, but it is also an integral part of the human body in complex inter-relation with the other parts. Its anatomical proportions and its physiological activities are before his mind. Its pathological disturbances, both local and those dependent on general disease, are known to him. He has at his disposal the use of all drugs necessary for his purposes, and of the indications for and against their employment he is fully aware.

In the investigation of diseases of the eye, the measurement of the acuteness of vision, both with and without lenses, is one of the first steps in the examination of the patient. In refraction work the surgeon takes into consideration the physiological activities of the normal eye. The hypermetropic eye he regards as developmentally imperfect. Astigmatism may be due either to developmental malformation or to disease. Presbyopia (loss of focussing power associated with advancing age) is a physiological condition, but undue rapidity in its progress may herald glaucoma, and

apparent recovery of focussing power may indicate the earliest stage of cataract. Myopia is in many instances pathological, and the myopic eye is exposed to grave disorders. With a comprehensive knowledge of facts such as these, the ophthalmic surgeon decides in a pure refraction case what lenses should be prescribed. With what lens the patient sees best is only one point he takes into consideration when prescribing. His aim is not only to improve vision, but also to secure the health and comfort of the patient. No case is dismissed until full ophthalmoscopic and other examination has excluded all objective signs of disorder.

If disease be present, its causation, whether local or general, has to be ascertained, and this demands a knowledge of the diseases of the other organs of the body which produce changes in the eye. The ophthalmic surgeon must have an adequate knowledge of diseases of the brain and central nervous system, of the blood vessels and vascular system, of the kidneys, of the nose and its accessory sinuses, of the various ductless glands, etc. In fact, there is no branch of medicine which is not in close relationship with this special domain, nor is there any specialty in which a general medical knowledge is of greater importance.

The public interest

It cannot be in the interests of the community to allow such grave responsibilities to pass into the hands of men with no medical training, and to hall mark by official recognition a practice involving such dangers.

Many people in the past have gone to opticians to obtain glasses for failing vision under the impression that they are fully qualified to prescribe. Official recognition of sight-testing opticians would encourage the practice and would increase the feeling of security which our arguments show to be unwarranted. There can be little doubt that this impression has been fostered by such " qualifications " as F.S.M.C., F.B.O.A. (Fellowship of the Spectacle Makers' Co., Fellowship of the British Optical Association), etc. It is the duty of the State to guard against legislation which may in any way entail detriment to the community.

APPENDIX.—HISTORICAL

An enquiry into the history of the science and art of refraction will show that this branch of ophthalmic work has been initiated and edeveloped by medical men, and that even at the present day the optician works and must of necessity work largely on the more purely empirical lines of the early part of the nineteenth century.

The discovery of spectacles as an aid to vision dates from the thirteenth century. There is no absolute certainty as to their first inventor, but the probabilities point to Roger Bacon (1214-1294), who, in his " Opus Majus," wrote of the enlarging power of a plano-convex glass and of its value " senibus et habentibus oculos debiles." Either directly from Bacon, or from some other monk, the discovery

became known in Italy, and at the end of the thirteenth century, spectacles were being made by Alessandro de Spina, a Dominican Friar, of Pisa. He did not claim to be the actual inventor, but had seen glasses made by someone else who was unwilling to reveal the secret. It may have been from Salvino d'Armato, of Florence, that Spina obtained the secret, since Armato's tombstone bears the inscription :— " Here lies Salvino d'Armato degl'Armati, of Florence, inventor of spectacles. God forgive him. Anno D. 1317."

If Roger Bacon invented spectacles it was probably sometime before the year 1267, when the " Opus Majus " was written for Pope Clement IV.

By the middle of the 14th century, convex glasses had become fairly common.

Concave glasses seem to have come into use first in the sixteenth century, and early in the seventeenth century Kepler wrote the first important scientific work on the use of spherical lenses.

The next important discovery did not take place till the beginning of the nineteenth century, when Thomas Young, the distinguished physician and physicist, in his " Memoir on the Mechanism of the Eye " (*Phil. Trans. Roy. Soc.*, 1801), gave the first description and measurement of astigmatism and a table of optical constants in close agreement with modern determinations. He had previously (1793) written a paper on the mechanism of accommodation which secured his election to the Fellowship of the Royal Society. His observations were subsequently confirmed by Airy in 1823, but remained practically unknown to opticians.

Until the year 1853 the prescribing of spectacles was entirely empirical. It was known that men, as they reached middle life, had difficulty in seeing to read, and that their difficulty was relieved by wearing suitable convex glasses. It was occasionally found that younger people also were helped in reading by the use of convex glasses, and they were said to have " old sight," a phrase still to be heard in use amongst opticians.

Another group of people was said to have " weak sight," and it was found that they were enabled to see more clearly in the distance by the use of concave glasses. The sale of spectacles was often in the hands of country pedlars, and people chose from the stock what seemed to suit them best.

With the discovery by Helmholtz of the ophthalmoscope and the ophthalmometer in 1853, the scientific investigation of the refractive media of the eye became possible, and the work of Donders, the great Dutch surgeon, speedily laid the foundations on which all modern refraction work is built. He showed the way in which a hypermetropic eye and a myopic eye depart from the normal, and the liability to disease existing in a myopic eye. He showed the relationship between the long-sighted eye and squint, and the essential difference between long-sight and old-sight. He discovered the frequency of astigmatism and laid down the rules for its detection and estimation, and showed how to determine the strength and position of the cylindrical glasses necessary for its correction. Donders also established a standard for normal vision, and for the first time rendered accurate " sight-testing " possible. He reconstructed the scale of lenses, substituting the metre for the inch as the unit of measurement.

This work has been continued and extended, corrected and amplified but the progress has been entirely due to the work of medical men.

In 1873 Cuignet, a French military surgeon, discovered an additional method of measuring the refractive condition of an eye, which rendered the ophthalmic surgeon still less dependent on the subjective methods previously in use. By the method of retinoscopy the skilled ophthalmic surgeon is enabled to make accurate measurements of the static error of refraction. These measurements can only be accurate in the absence of any accommodative effort on the part of the patient under examination. This condition of absence of accommodative effort can only be ensured by the use of drugs which paralyse the ciliary muscles.

At a later date the use of prismatic glasses was introduced by medical men to alleviate symptoms due to errors in the muscular balance of the two eyes, and the determination of the conditions under which prisms should be ordered is one of the most difficult problems an ophthalmic surgeon has to solve. It involves the knowledge not only of the inborn defects of musculature, but also of acquired defects, and of the pathological causes which may produce them.

ANNOTATIONS

The Status of Sight-testing Opticians

The question whether sight-testing by opticians should or should not be legally recognized is one with which members of the Medical Profession in this country, especially those interested in ophthalmology, are familiar. It has been brought before them more prominently, recently, by the renewed efforts of the opticians to obtain recognition by means of a bill in Parliament. The importance of the question is fully recognized by all ophthalmic surgeons, less fully by the medical profession generally, and scarcely at all by the lay public, whose welfare it most closely concerns.

The claims of the opticians, as set forth in their latest petition to the Legislature, have been given prolonged consideration by the Council of British Ophthalmologists, whose report thereon is now made public (*vide* p. 554).

An authoritative opinion such as emanates from this Council is opportune, and its reasoned statements in opposing the claims of the opticians, should appeal strongly to our legislators if they are again petitioned to grant State recognition to sight-testing opticians.

In their main contention the Council of British Ophthalmologists are, in our opinion, in an unassailable position. The opticians state confidently that "a qualified optician, especially when holding a Fellowship certificate of the (British Optical) Association would recognize a case in which the eye, through disease or otherwise, could not be properly treated by glasses, and would direct the patient to an ophthalmic surgeon or medical man."

The Council maintains that no individual who has not had a full medical training can possess the skill and judgment necessary to recognize whether failure of sight is due wholly to the need of glasses, or is caused by disease in the eyeball, optic nerve or elsewhere in the body. It follows logically that anyone who, with no more than the training of an optician, undertakes to differentiate such cases, becomes a source of danger to those members of the public who apply to him for glasses.

The statement is made by the opticians in their petition that "In a very large majority of refraction cases . . . members of the public do, in fact, visit an optician rather than an ophthalmic surgeon or a medical man." This statement is undoubtedly true, and it is this action of the misguided public which the sight-testing opticians desire to encourage, that provides the lamentable

cases, which come later under the observation of ophthalmic surgeons, of irreparable injury to sight accruing from the inability of the optician to discriminate between refractive error and disease.

The greater portion of the Council's report deals with the question at issue; appended thereto is a brief historical account of the science and art of refraction, and of the origin of spectacles.

The status of sight-testing opticians has also been discussed by the Departmental Committee of the Ministry of Health on " The Causes and Prevention of Blindness " recently in session. The report of this Committee has now been published, and may be obtained from one of His Majesty's Stationery Offices.

Nettleship Memorial Volume

The Francis Galton Laboratory at the University of London have recently issued an important publication as a memorial to the late Edward Nettleship. The present issue deals with only a few of the diseases in which Nettleship was interested, and it is hoped that a further volume may appear later, dealing with the inheritance of colour blindness, a subject on which, as all our readers know, Nettleship did a very great amount of work. The volume issued is prefaced by an admirable memoir on Edward Nettleship by Mr. J. B. Lawford. The subjects dealt with in this part are retinitis pigmentosa and allied diseases, congenital stationary night blindness, including, of course, the well-known Nougaret family, and glioma retinae. An excellent photograph of Mr. Nettleship forms the frontispiece, and there are reproductions of Usher's ophthalmic pictures of that very rare condition, choroideremia and twenty-six plates of pedigrees of eye disease. The book will prove a valuable one to all interested in inheritance of eye disease and in Mr. Nettleship's work thereon, and we must congratulate Dr. Julia Bell and the Francis Galton Laboratory on having made this work available in such a beautiful form. It must depend on the support that this publication receives whether the work can be continued or not. Unfortunately the production of such a work, which can only have a limited sale, is costly and the price is a little on the high side.

ABSTRACTS

I.—TRACHOMA IN PALESTINE

Ticho, I. and Kligler, I. J.—Trachoma in Palestine. *Lancet*, September 30, 1922.

In this article dealing with trachoma in Palestine, the incidence of which is not definitely known, the first-named author deals with diagnosis and treatment, while the second deals with aetiology, transmission and control. The diagnosis is, as we all know, difficult. According to **Ticho**, to the practised eye the difficulty is not really as great as it may appear. "The cicatrice in the sulcus subtarsalis is so characteristic that a diagnosis can be readily made by lifting the upper lid; this cicatrice resembles a chain of hyphens. The presence of solid follicles typically localized (sulcus subtarsalis, transition folds, conjunctiva of the tarsus, plica semilunaris) is also diagnostic. Soft granules, cicatrice and papillae which resist treatment are all diagnostic. Nevertheless many cases must remain doubtful." Dealing with mixed infection this author says that the acute papilla and the acute pannus in apparently cured cases of trachoma which accompany the Weeks trachoma mixture affect favourably the course of the trachoma. And, also, that although gonococcal infections are the chief cause of blindness, in many cases, when mixed with trachoma, they protect the eyes against total blindness by the appearance of acute pannus, which covers the cornea with a protective film and prevents destructive ulceration.

Kligler admits at the outset that the aetiology of trachoma is undetermined. From observations in Palestine it appears to be a specific contagious disease. The important statement is made that fresh uncomplicated trachoma is seen especially in young children of pre-school age. Up to the present, material from uncomplicated cases has elicited no reaction when injected into rabbits. Unlike other forms of conjunctivitis trachoma does not occur in epidemic form in Palestine. Since trachoma is chiefly a disease of children, control means thorough supervision of the school children, associated with continuous treatment. In Jerusalem this has resulted in the reduction of the trachoma incidence in the school from 31.3 per cent. in 1913 to 13 per cent. in 1916, though during the war it rose again to 21.7 in 1919 and 20.1 in 1921. While the incidence is thus reduced by steady and continuous treatment the problem of the prevention of new infection presents many difficulties. Just at the time when the incidence of new infections is greatest the child is not under the supervision of either

physician or nurse. Successful attack upon the disease necessitates visiting the homes and families of children who are constantly exposed to infections, and examining and treating the families as well as the children of pre-school age. In this way the disease can be found at its onset and its progress intercepted. The author refers to the importance of education as an element in the treatment of trachoma. Education in the value of cleanliness should prove helpful, but it has so far been little employed in Palestine. Another factor, the significance of which is as yet obscure, is diet. The experiments of Osborn and Mendel and of McCollum on the relation of dietary deficiency to conjunctivitis are, the author considers, highly suggestive and promise to open a new approach to a difficult problem.

ERNEST THOMSON.

II.—HYPERTHYROIDISM AND AMETROPIA

Sourasky, A. (Sheffield). — On errors of refraction in hyperthyroidism. — *Lancet*, September 16, 1922.

Sourasky has studied 20 cases of hyperthyroidism (16 of which had exophthalmos) with a view to the ascertainment of the refractive condition, and expected to find that in exophthalmos the loss of balanced pressure to which the eye is normally subject would lead to changes in its contour. The expectation seems to have been realized since, out of the 32 exophthalmic eyes, 29 were astigmatic. Further, myopic astigmatism was in undue proportion 12 eyes having myopic and 14 hypermetropic astigmatism. Of the 4 cases (8 eyes) without exophthalmos, 6 had compound hypermetropic astigmatism, 1 compound myopic astigmatism, and 1 myopia. The axis of the astigmatism "does not seem to follow a certain course, as one would expect if it were due to pressure of the lids on the protruding eyeball. Furthermore, it was present in 7 out of 8 eyes where there was no exophthalmos." Out of the 40 eyes examined 36 were astigmatic. The author concludes that hyperthyroidism causes astigmatism, but is unable to decide whether the astigmatism is a general manifestation or is caused by the changed local conditions. Dealing with hyperthyroidism and headache the author says: "The almost constant presence of astigmatism in the hyperthyroid state would lead one to expect that these patients should suffer from headaches. And this is indeed the case. Out of the 16 patients with exophthalmic goitre 13 suffered in this respect. Out of the 4 hyperthyroid patients, 3

were subject to headaches. Moreover, all the patients who had their astigmatism corrected reported the disappearance of this symptom. And more than this, many patients stated that they feel much better generally since wearing glasses. It is quite conceivable that much good can follow the correction of astigmatism in patients whose nervous system is unstable, as it is in hyperthyroidism. This would be so irrespective of whether the hyperthyroidism caused the astigmatism, or whether the symptoms of a pre-existing astigmatism were merely brought out by the hyperthyroidism."

ERNEST THOMSON.

III—AMAUROSIS IN INFANTS

Doyne, P. G. (London). — Amaurosis in infants. *Lancet*, September 16, 1922.

Doyne deals with amaurosis in infants, that is, amaurosis not associated with an obvious ocular lesion such as cataract, malformation of the eye, or gross retinal disease. The cases include amaurosis with mental deficiency, partial albinism (defective fundus pigmentation), and temporary amaurosis associated with basal meningitis, followed by recovery. Five illustrative cases are recounted. The author opens his lecture, which was delivered at the Hospital for Sick Children, Great Ormond Street, with a reference to the development in the child of the faculty of vision and the fusion sense. In this connection the reviewer is inclined to quarrel with the author for the following sentences: " Binocular vision, or, in other words, the desire for fusion of the images of the two eyes, continues to develop up to the age of 6. This is significant when dealing with cases of squint, in which absence of the faculty of fusion is the underlying cause, as, after the age of 6, attempts to improve this faculty will fail." Such a presentation of the case, legitimate enough if given to a purely specialist audience, seems unwise where the audience is non-specialist, as it presumably was in this instance. A non-specialist would be extremely likely to understand from hearing or reading the statement that it is useless to bother about the treatment of squint after the age of 6 years. Such an interpretation of the author's meaning would presumably be incorrect.

ERNEST THOMSON.

IV.—RETINAL ANGIOSCLEROSIS

Copps, L. A., M.D. (Marshfield, Wisconsin).—Retinal angiosclerosis. *Amer. Jl. of Ophthal.*, November, 1921. Series 3, Vol. IV, No. 11.

Copps gives an interesting summary of the pathology and ophthalmological appearances of angiosclerosis of the retina, with the report of six illustrative cases. In a preliminary paragraph he points out that the presence of angiosclerotic changes in any part of the body, however limited locally in their manifestations, is but the evidence of general disturbance, and the study of such changes in the retina is chiefly of interest from its general and prognostic value. He gives the three greatest causes of sclerotic changes in blood vessels thus:—

1. Intoxications.
2. High blood pressure.
3. Senility.

After a short sketch of the pathology of the condition as it affects the retinal vessels Copps goes on to discuss the ophthalmoscopic appearances of vascular changes in the retina, distinguishing between *hypertension* unaccompanied by arterio-sclerosis, in which the vessels tend to become uniformly distended, *angiosclerosis*, in which the walls of the vessels are thinned and relaxed, and the late stage of hyperplastic rigidity.

The ophthalmoscopic appearances in each of these conditions is given with considerable detail. The significance of vascular disease of the retina in the interpretation of general vascular disease is dealt with, and the literature briefly reviewed. The paper ends with the history of six cases occurring in the experience of the author. In all of these, with one exception, the general condition was found by first detecting the retinal changes. The paper is illustrated with the fundus view of each case.

J. HAMILTON MCILROY.

V.—PHAKOERISIS

de St. Martin (Toulouse).—Barraquer's phakoerisis. (A propos de la phakoerisis de Barraquer). *La Clin. Ophtal.*, September, 1921.

It is not so long since oculists from far distant parts of the world made the pilgrimage to Amritzar in order to learn at first hand how Smith extracted the lens in its capsule. Now it is the turn

of Barcelona, where, evidently, Barraquer is extracting lenses in the capsule by the thousand by his suction method. New methods at first may seem simple; then it transpires that there are difficulties, and one finds men having to make the pilgrimage in order fully to appreciate these, and to learn from the master. **St. Martin**, like many others, has been impressed with the importance of the Barraquer operation, and has completed a period of study at Barcelona. It is evident, reading between the lines, that he has not found the method so simple as might be expected from the published accounts. That the results in the hands of Barraquer are really excellent there seems to be no doubt. Thus, of twelve patients operated on *in one day*, five obtained V.A. 10/10, three obtained 9/10, two obtained 8/10, one obtained 7/10, and one obtained 5/10. Further, of these twelve cases seven were able to read No. 1 print at periods varying from the tenth to the twentieth day. Yet St. Martin, referring to his own results, is quite guarded, offering no opinion "because his operations have been as yet few in number." Points of technique occupy four pages of St. Martin's article, which may be referred to by any who propose to attempt the operation. It will suffice here to emphasise what seem to be the most important, namely: (1) To obtain by early employment (three hours before operation) of euphthalmin, sufficient "inertia" of the iris, a sufficiently complete "pupillo-plegia"; (2) to avoid the least pressure on the globe, by paralysing the orbicularis by means of the van Lint-Villard technique, and by discarding the blepharostat in favour of the retractor of Desmarres; (3) to make a clean section of the cornea and, most difficult of all, to make a peripheral iridectomy on an iris which is under the influence of a mydriatic. Understood, of course, that a complete iridectomy can be made if desired; (4) to be careful with the wound toilette, and, in particular, to allow no blood to remain in the anterior chamber. Of the actual extraction of the lens by the suction apparatus St. Martin says little. He points out, however, that if, for any various reasons, the sucker lets go it can, given sufficient delicacy of manipulation, be reapplied without danger. In one case where the zonule was extremely resistant the sucker let go eight times before the extraction could be completed, and that without loss of vitreous.

(NOTE.—The van Lint method of paralysing the orbicularis consists in injecting 4 cc. of 2 per cent. novocain close to the bone at the lower and outer margin of the orbit where lie the malar branches of the facial nerve which supply the orbicularis. See Report of meeting of *Soc. française d' Ophtal.*, May, 1921, in *La Clin. Ophtal.*, July, 1921, and also *Quain's Anatomy*, 9th Edition, Vol. I, p. 573.—E. T.)

ERNEST THOMSON.

VI.—SYMPATHETIC IRIDOCYCLITIS

Harbridge, D. F.—Sympathetic iridocyclitis and possibly related processes in other parts of the body. *Amer. Jl. of Ophthal.*, April, 1919.

Harbridge advocates the view that the essential causative agent of sympathetic iridocyclitis is to be found in tissues other than those of the injured eye, and that trauma, or ulcerative processes, which usually are looked upon as the main cause of the disease, are possibly only contributory factors.

He points out that clinically sympathetic iridocyclitis does not differ from so-called idiopathic or non-traumatic iridocyclitis. Out of 400 patients having injury of the eyeball, the writer has met with only one case of sympathetic inflammation, although he has had several cases of *irritation* in which removal of the injured eye led to cessation of the signs. He questions whether, if left to run their course, such cases would have developed sympathetic iridocyclitis.

He quotes a case of severe plastic iridocyclitis in which, as the signs of inflammation began to subside in the affected eye, typical signs developed in the fellow eye. Nothing amiss could be found in the general condition with the exception of two teeth which exhibited apical abscess. Removal of these teeth was followed by complete recovery of the eye condition.

Another case in which sympathetic inflammation developed some months after cataract extraction was found to have many decayed septic teeth, with alimentary disturbance. Harbridge emphasises the need for careful examination of the condition of the nose, throat, etc., in order to detect possible foci of infection. He questions whether sympathetic disease is due to any *specific* cause, being inclined to the view that it is a secondary disturbance due to local changed metabolism, the source being either in the uvea of the injured eye, or in some other part of the body. Every injury of the eye may be accompanied by a low-grade inflammation of the fellow eye, which causes the tissues of the latter to be more susceptible to bacterial invasion on account of lowered resistance. Not every wound of the uveal tract is followed by sympathetic trouble; many such wounds heal and remain quiet. They cannot all be aseptic, but the bacteria in certain cases may be more benign than in others, or may possess greater affinity for uveal tissue. If the bacteria were all virulent at the time of injury, prompt destruction of the injured eye would follow. Streptococci or other micro-organisms may affect the injured uvea at the time of injury; these may be derived from another focus (teeth, etc.), and it is only after a length of time that they develop

affinity for the corresponding tissue of the other eye. He reasons that the exciting eye, if still endowed with a certain amount of serviceable vision, should not be enucleated, since amelioration of the symptoms in the sympathising eye does not appear to be certain. Only an exciting eye which is *useless* should be enucleated.

With reference to anaphylaxis, he draws attention to the decrease in frequency of sympathetic disease, and is of opinion that this fact in itself speaks against anaphylaxis as a cause.

J. HAMILTON MCILROY.

VII.—LEBER'S DISEASE

Lagrange, Henri.—Hereditary optic atrophy (Leber's Disease). (De l'atrophie optique héréditaire : maladie de Leber). *Arch. d'Obhtal.*, September, 1922.

Apropos of the report of a case, **Lagrange** reviews briefly but clearly much of the published work on the clinical characters and pathogenesis of this disease. His patient was a male aged 18, who presented the well-known clinical features of the disease; vision was reduced to 1/10 in the right and to 1/2 in the left eye. Two of his maternal uncles were similarly affected, but no information was obtainable regarding previous generations. Lagrange made an exhaustive examination of his patient; several radiographs of the region of the sella Turcica and hypophysis were taken, but revealed no abnormality; measurements of the skull showed that its contour and proportions were normal. Haematological examination, however, revealed a notable abnormality; while the blood count was within normal limits, the coagulation rate was markedly retarded, and the clot formed was feebly retractile. Three measurements (the blood being withdrawn under exactly similar conditions) showed a retardation in coagulation of 26 minutes, 24 minutes, and 25 minutes. From the weakly coagulum a thin transparent yellow serum exuded.

These haematological findings are similar to those obtained in cases of haemophilia. The author considers as most noteworthy the discovery in the subject of an hereditary malady, transmitted by the mother according to Mendelian laws, a pathological condition of the blood, which, though it has not elucidated the pathogenesis of haemophilia, is looked upon as its haematological characteristic.

As hereditary disorders Leber's disease and haemophilia are

comparable. Both are almost sex-limited, and are transmitted by unaffected females to their male children.

Lagrange's patient was treated actively by thyroid extract in increasing doses for a period of six weeks. He exhibited perfect tolerance of the drug, and its administration was followed by an improvement in the sight of the right eye from 1/10 to 1/2, but the vision of the left eye deteriorated slightly (from 1/2 to 1/3+).

Lagrange counsels the early adoption of organo-therapy in cases of Leber's optic atrophy.

J. B. LAWFORD.

VIII.—THE ZONULE

Beauvieux (Bordeaux). The Zonule. A topographical and histological study. (La Zonule. Étude topographique et histologique). *Arch. d'Ophtal.*, July-August, 1922.

After studying numerous works of previous investigators the writer found the subject so complex and difficult that he decided to undertake an independent research concerning the zonule. In a long, interesting and well-illustrated paper he reports the result of his studies: they support in many points the researches of others and present some original observations which he hopes may be subsequently confirmed. The paper extending to more than 26 pp. is so long and detailed that it would be very difficulty to deal fairly with it in an abstract. It will repay perusal by those interested. We give here, somewhat curtailed, the "Physiological and Clinical Deductions" with which the author concludes his paper and in which he expounds his views. In it he refers to certain topographical and histological features described by him in the earlier part.

1. The suspensory system of the lens is wholly contained in the posterior chamber. It is an autonomous apparatus and forms a veritable peri-crystalline canal with proper walls composed of the fibres of the zonule cemented together by an amorphous substance without apparent structure. The cavity of this canal traversed by the equatorial and para-equatorial fibres is occupied by a semi-fluid material, structureless, very transparent and very hygrometric, differing in its characters from the aqueous humour which fills the peri-zonular space, and resembling vaguely the vitreous humour. The author does not accept the view that the zonule consists of a series of filaments with intervening fissures, through which the aqueous freely circulates. He holds that the aqueous, secreted or transuded at the level of the ciliary processes, penetrates by osmosis into the canal of Hannover and leaves it by the same process.

Without considering the peri-equatorial canal as a lymphatic channel it is nevertheless reasonable to allow that the circulation of the aqueous humour is regulated by the anatomical arrangement of the suspensory ligament as described by **Beauvieux,** and that this arrangement plays a considerable rôle in the nutrition of the lens.

In an article on the circulation of intraocular lymph, apropos of the experiments of Bono and Frisco with coloured injections, Angelucci says, "Another portion of the colouration surrounds the crystalline lens following the peri-lental space, whence it apparently should join the central canal of the papilla. . . . Injections into the vitreous showed that the colour spreads around the zonule of Zinn to reach the periphery of the iris." In this connection, moreover, the experiments of Samelsohn and Fuchs should be recalled. These observers, introducing particles of iron into the vitreous, were able to see particles of rust close to the equator of the lens forming a sort of coronet corresponding exactly to the anterior border of the zonule. Schlösser concluded that the nutritive fluids of the lens escaped at the level of pre-equatorial apertures into the posterior chamber. There is no doubt that the peri-crystalline inter-zonular canal provides the afferent and the efferent path of the nutritive fluids of the lens, the flow of which Beauvieux believes is regulated by osmosis. He has never been able to discover the existence of apertures. In a case of irido-cyclitis in a child of 12, he found the zonule fibres, their cementing material and the cavity of the canal, crowded with epithelial detritus and red and white corpuscles, which in sections mapped out exactly the peri-equatorial triangular ligament. It is much to be desired that more extended physiological investigation should be undertaken to determine the function of the inter-zonular space, alterations in which consecutive to those in the ciliary body, certainly play a preponderating rôle in the genesis of cataract.

2. The arrangement of the zonule fibres, the position of their principal insertion on the *pars plana* of the retina and their close connection with the ciliary muscle favour the Helmholtz theory of accommodation. In distant vision the zonule is in a state of relative tension, the ciliary muscle being then at rest, either naturally or through inhibition of the sympathetic. During accommodation, on the contrary, the zonule is relaxed: from the anatomical point of view it could not be otherwise. Some of the author's microphotographs show definitely that the attachment of the zonule fibres extends from the limit of the ciliary ridges and hollows as far as the ora serrata. Contraction of the ciliary muscle draws forward the choroid, the *pars plana,* and even to a certain degree the peripheral portion of the vitreous. Relaxation of the zonule fibres follows inevitably. The anterior fibres and the greater part of the posterior start from the orbiculus ciliaris: a few bundles of the

posterior fibres, it is true, arise a little further forward immediately behind the summit of the processes, but never in the hollows or on the ridges. These bundles also are relaxed in accommodation. Hess in an iridectomised eye under eserin has seen the ciliary processes displaced forwards to a point well in front of the equator of the lens. Similarly Heine in the monkey and Beauvieux in rabbits and dogs have found the processes shortened, thickened and more rounded and displaced forwards towards the edge of the lens; the converse is seen after the use of atropin. Does not this prove that the whole retino-ciliary system is carried forward and that the fibres of the zonule are thereby relaxed? In view of his researches Beauvieux finds it very difficult to accept Tscherning's statement that "the place of insertion of the free part of the zonule corresponds to the summits of the ciliary processes or to a point slightly posterior to the summits; it is almost on a level with the insertion of the muscle to the wall of Schlemm's canal and is necessarily drawn a little backwards by contraction of the muscle. It follows that the fibres which pass to the anterior surface of the lens, and whose direction is almost that of the muscle will be tense, while the fibres passing to the posterior surface will be relaxed." No zonule fibres are inserted at the level of Schlemm's canal; the anterior fibres arise high up on the *pars plana*, and even if some of the posterior groups spring from a lower site at the beginning of the ciliary processes, this region is, the writer thinks, far removed from the region of the muscle. Hence if it is correct that the ciliary muscle in contracting draws towards the centre of contraction its choroidal portion on the one hand and its point of attachment to the cornea on the other, it follows that the choroid, the ciliary part of the retina and the peripheral portion of the vitreous will be drawn forwards and the corneo-iridic angle will be pulled slightly backwards (the deepening of the angle of the anterior chamber during accommodation). But this action of the muscle would be without influence on the fibres of the zonule which as the author has demonstrated have a relation merely of contact and not of adhesion to the ciliary processes.

In considering solely the topographical relations of the zonule it is possible to maintain with Tscherning that the action of the posterior portion of the muscle draws the periphery of the vitreous towards the crystalline lens; at the same time it increases the resistance of this part while diminishing that of the central retro-lental part; on the other hand the contention of this observer that the contraction of the anterior part of the ciliary muscle exerts traction on the anterior lens capsule while causing relaxation of the posterior capsule appears to Beauvieux untenable from the anatomical point of view.

The author's research was almost finished when Marbaix

published his paper on extraction of cataract in its capsule by the suction method of Barraquer without a vibratory vacuum (*Ann. d'Ocul.*, Nov., 1921). Beauvieux discusses some of the problems raised by his confrère, and Rochon-Duvigneaud has made some reservations concerning the operation as described by its inventor. The aim of the operator by Barraquer's method is rupture of the whole zonule at or near its attachment to the lens. The writer has shown that the ciliary processes and intervening hollows are merely covered in their posterior part by the suspensory ligament. They are therefore unimplicated, and he is convinced that complete extraction of the cataracatous lens by a vibratory vacuum has no ill-effect in their region. But is it certain that the vibrations of 45 to 65 centimetres of mercury used by Barraquer in certain forms of senile cataract induce rupture of the zonule fibres near their insertion into the capsule? Is it not probable that the rupture occurs further back and produces genuine tearing of the epithelium of the *pars plana*, or at least attrition of these elements which may explain the late cyclitis and irido-cyclitis recorded in literature of this subject? The author has frequently tried on enucleated eyes to remove the lens in its capsule by its posterior surface, and has noted a surprising resistance—the traction necessary being much greater than he expected. Rupture usually occurred in the free portion of the ligament, but some fibres were pulled away from the *pars plana*, bringing pigmentary debris with them. By the anterior surface on the contrary a gentle and persistent pressure induced rupture with much less effort. He thinks this is because the fibres are pulled in the bottom of the ciliary hollows and bent, so to speak, against the adjoining ridge; they then give way between this reflected portion and the attachment to the capsule. For this reason Beauvieux thinks extraction of the lens by means of suction, but without a vibration vacuum is a method more rational and less mutilating than that by means of vibratory vacuum. He has tried this plan on two enucleated human eyes and has established by examination that the fibres have given way at the level of the walls of the canal of Hannover, i.e., close to their insertion into the capsule. He would like to repeat this experiment with the eresiphake in order to compare the two methods from the histological point of view.

In his paper Beauvieux draws special attention to the relations of the crystalline lens and its suspensory ligament to the hyaloid and the vitreous, a relation of contact only, the hyaloid not being adherent except at the level of the ora serrata. The hyaloid-capsular ligament if it exists, is of the slenderest. This explains why it is easy to remove the lens in its entirety without fear of escape of vitreous. In Barraquer's operation loss of vitreous occurs only if there is faulty technique or sudden movement by the

patient leading to rupture of the hyaloid. The author fears that phakoerisis with vibratory vacuum has sometimes a harmful effect on the " orbiculus ciliaris," the site of insertion of the zonule. Further experience will, without doubt, demonstrate the correctness or incorrectness of these anatomical deductions. The suggestion of Marbaix to extract in the capsule by simple non-vibratory suction is, in the author's opinion, very judicious and deserving of attention.

J. B. LAWFORD.

BOOK NOTICES

Ophthalmological Society of Egypt. Bulletin of 1922. Cairo, 1922.

This volume of 92 pages includes the proceedings of the 19th Annual Meeting of the Ophthalmological Society of Egypt held on March 31, 1922, at the Kasr El Ainy Medical School, under the presidency of Dr. Mohammed Bey Saleh. Sixty members were present. It will be remembered that the Society issued a report on the means of prophylaxis against trachoma, etc. (*see Brit. Jl. of Ophthal.*, March, 1922, p. 126).

The Minister of Education took exception to this report. The *Bulletin* now prints a reply, in the course of which it says: " The Committee are not prepared to alter their report by a single paragraph." The *Bulletin* contains many interesting communications. Mr. MacCallan enters fully into a description of 15,619 cases of blind patients who applied for treatment at the Egyptian ophthalmic hospitals during 1921, or 12.2 per cent. of the patients. Conjunctivitis accounted for the great majority of the blind. Other notable causes were glaucoma, cataract, endogenous iritis, optic atrophy and injury. Dr. Tewfik speaks well of injections of milk and records a case of gonorrhoeal ophthalmia with corneal complications and of abscess of the orbit and of a dendritic ulcer of the cornea successfully treated by that means. Dr. R. V. Dolbey, during the last fifteen months, has met with four cases of ethmoidal sinus suppuration simulating orbital tumour. Dr. M. Riad examined the fundi in twenty cases of severe anaemia due to ankylostoma worm infection. When haemoglobin in the blood varied from 60 to 70 per cent. nothing was found in the fundi except dilatation of the veins and slight paleness in the colour of the choroidal reflex. When the haemoglobin varied between 30 and 50 per cent. the choroidal reflex was of a light yellow colour and the retinal veins resembled flattened ribbons. In one of these cases there were a few white dots along the right superior temporal artery, with two flame-shaped haemorrhages in the inferior

temporal quadrant. In another case vision was poor and both optic discs were pale; contraction of the fields of vision.

We note that pathological material supplied by members of the Society will be reported upon free by the Society. The *Bulletin* gives directions how to collect and prepare specimens for examination.

S. S.

Précis d'Ophtalmologie. By Dr. V. MORAX, Ophtalmologist de l'hôspital Lariboisière. Troisième édition refondue, Paris. Masson et Cie, 120, Boulevard St. Germain. 1922.

Although the third edition of Dr. Morax's excellent *Précis d'Ophtalmologie* bears the date 1921 it did not reach us until the present year was well advanced. Hence the delay in the appearance of this notice. It may be said, however, that it is one of the best of the smaller text-books of ophthalmology. There is but one criticism to make, namely, that many of the black and white illustrations are deplorably inartistic and unworthy of the book.

S. S.

CORRESPONDENCE

PROFESSOR VOGT'S COURSE OF MICROSCOPY OF THE LIVING EYE AT BASEL

To the Editor of THE BRITISH JOURNAL OF OPHTHALMOLOGY

SIR,—We have been interested for some time in microscopy of the living eye, and on learning from an advertisement in the Continental ophthalmic journals that Professor Vogt, of Basel, was proposing to hold a course in *Spaltlampenmikroskopie* during the first week of September we arranged to attend. The course took place in the University Eye Clinic and lasted for six days, there being lecture demonstrations for four to five hours daily. About thirty oculists attended, twelve countries being represented, and the teaching, as is usual on the Continent, was very practical in character.

Professor Vogt had at his disposal about a dozen Zeiss corneal microscopes with the Gullstrand slit-lamp illumination, and dealt very fully with the microscopy of the cornea, iris, lens and vitreous in both normal and pathological cases. We cannot praise too highly the careful and efficient manner in which he and his staff of demonstrators conducted the course. No efforts were spared to enable each individual attending to overcome the technical difficulties of the instrument, and a very large number of cases of

great clinical interest were provided for examination. The sum of thirty francs to cover expenses was asked, but no fee. Should Professor Vogt hold a similar course next year, any British ophthalmologist who wishes to attend may be assured of a hearty welcome in Basel and a most interesting and profitable week of instruction.

Yours truly,

JAMES V. PATERSON,
E. H. CAMERON.

EDINBURGH.

BUTYN—A SUBSTITUTE FOR COCAIN

To the Editor of THE BRITISH JOURNAL OF OPHTHALMOLOGY

SIR,—My attention was directed to butyn by Mr. W. M. Beaumont, of Bath, who kindly sent me a small quantity of a 2 per cent. solution for trial.

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The claim that anaesthesia is more profound than with cocain would therefore appear to be justified.

The mild hyperaemia of the conjunctiva was in no way troublesome, and the bleeding from the conjunctival flap was not appreciably increased.

The absence of mydriasis and desiccation of the cornea was noteworthy, and there were no post-operative complications of any kind.

This very limited experience has been so satisfactory that it is recorded in the hope that butyn may become extensively used by ophthalmic surgeons in India, where the illicit use of cocain has reached serious dimensions. Smugglers of the drug have become so numerous and so daring that they recently enticed a band of Calcutta Police to personal combat on the river.

The value of an efficient substitute for cocain which is harmless from the social point of view cannot be overestimated, and its use is in the nature of a moral obligation.

For all necessary particulars regarding butyn, reference should be made to the article by Mr. Beaumont in the July number of this journal.

Yours, etc.,

R. M. DICKSON, M.D., D.O.M.S, Major R.A.M.C.

September 28, 1922.

NOTES

Appointments

MR. HUGH WOODWARD BARNES has been appointed Surgeon to the Victoria Eye and Ear Hospital, Hereford, and Ophthalmic Surgeon to the Hereford General Hospital. MR. W. BARRIE BROWNLIE has been appointed Medical Referee for ophthalmic cases under the Workmen's Compensation Act for County Court Circuit No. 3.

* * * * *

The Parliamentary Election

SIR GEORGE BERRY, Surgeon Oculist to the King for Scotland, has been returned unopposed as one of the three Members of Parliament who represent the combined Universities of St. Andrews, Glasgow, Aberdeen and Edinburgh.

* * * * *

Ophthalmological Society of Egypt

THE following are the names of the Officers of the Ophthalmological Society of Egypt elected for 1922-1923: President, Dr. Ahmad Fahmy El Rashid Bey; Vice-President, Dr. Mahmoud Zaki; Hon. Secretary, Dr. Mohammad Mahfouz; Asst. Hon. Secretary, Dr. Hassan Barrada; Hon. Treasurer and Archivist, Mr. A. F. MacCallan.

* * * * *

The Oxford Ophthalmological Congress

THE Oxford Ophthalmological Congress will meet on July 4 to 7 inclusive, 1923. A discussion on "The Relationship of Dental Sepsis to Diseases of the Eye" will be opened by Mr. W. Lang (London), Dr. W. R. Ackland (Bristol), and Dr. K. K. K. Lundsgaard (Copenhagen). The Doyne Memorial Lecture will be delivered by Dr. H. M. Traquair.

* * * * *

International Ophthalmological Congress

THE next International Ophthalmological Congress will be held in London in 1925.

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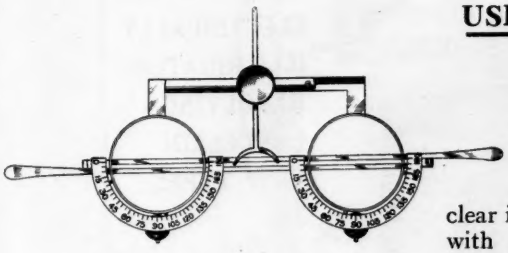

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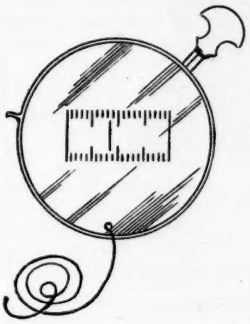

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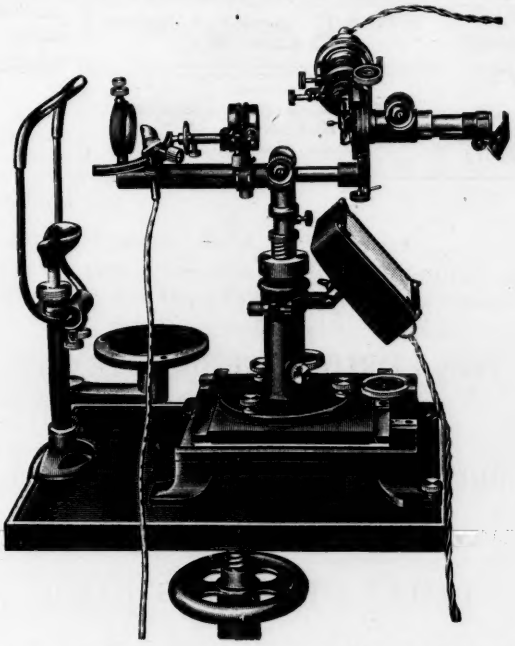

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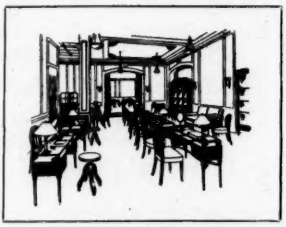

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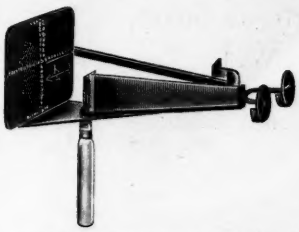

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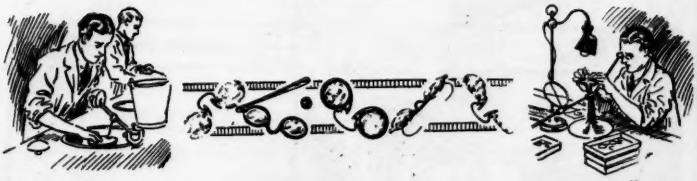

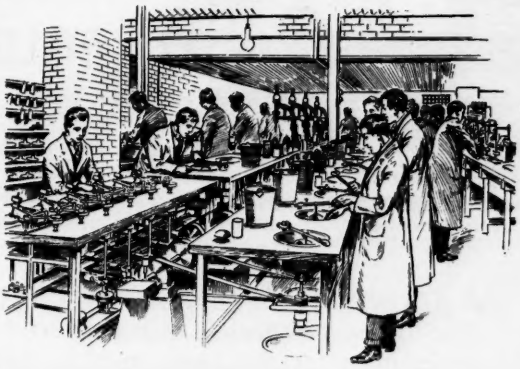

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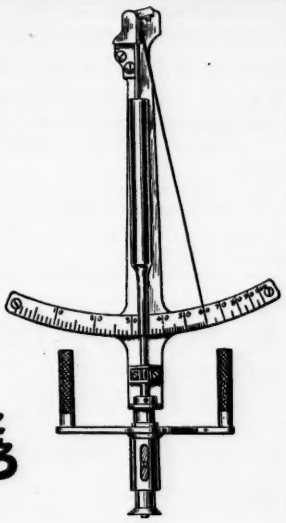

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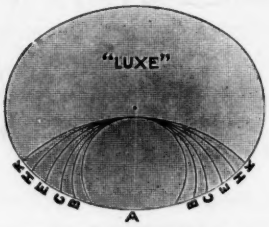

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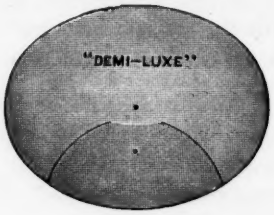

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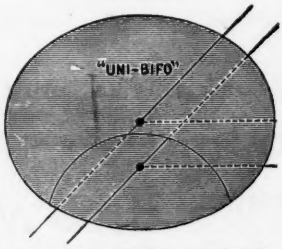

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